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ABSTRACT

This overview of the use of computers in educational film library management provides brief discussions of some current issues and problems, descriptions of seven operating systems, and a case study of the selection of a computer system for the facility at the University of Minnesota. Described are basic computer systems; advantages of their use for film libraries; and the integration of computers for management, systems analysis, programming, machine operation, and clerical/administrative functions. A brief description of seven large educational film library automated systems is offered, five of which are members of the Consortium of University Film Centers. These systems include the Scholastic Instructional Materials System (developed by the Burroughs Corporation), the Singer System Ten, The Shell Oil Company Film Library, the Middle Iowa Educational Cooperative Consortium, and university film libraries at the University of Iowa, the University of Illinois, the University of Wisconsin, and the University of Minnesota. These systems are reviewed and a special case study is reported for the system developed at the University of Minnesota. Procedures used to acquire, develop, and operate the system are highlighted, with cost facts and administrative relationships external to the library specified. (RAO)

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INTERNATIONAL COLLOQUIUM

DIJON - June 19-23, 1978

ECONOMIC ANALYSIS FOR EDUCATIONAL TECHNOLOGY DECISIONS

A STUDY OF A DATA PROCESSING SYSTEM FOR THE CONTEMPORARY FILM LIBRARY

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A STUDY OF A DATA PROCESSING SYSTEM FOR THE CONTEMPORARY FILM LIBRARY

Introduction to the Electronic Data Processing Rationale

As a result of an onslaught of paper and the need for efficient use of money, time and personnel required in processing, storing, and retrieving information in film library management, there is a need for faster methods and techniques in improving all aspects of the documentation problem for the librarian. The size and the mass of documentation, as well as the increase in dependence upon documents, makes it necessary to explore ways in which a reduction in documentation costs, ways to increase the speed of transmission of information, and ways in reducing labor encompassing manual and clerical effort necessary to sustain total efforts for film libraries. Electronic data processing provides the mechanization and automation necessary.

The product or service of library can be redesigned to make it more attractive in the educational market place. Advertising and sales promotion may, of course, be stepped up to reach a wider audience. Internal cost reduction programs can and have been initiated to reduce expenses. The business system used to sustain library operations can be redesigned and updated to secure greater efficiency. The systems used in managing film libraries, for example, despite warning signs of inefficiency and obsolescence often continued to be operated in much the same old way with only an occasional patch work repair program to keep it running from day to day.

With growth, a certain maturity evolves. With maturity, sound judgment and intelligent direction may be applied by those in control whether they carry a machine or the human element of directorship. Many of the business systems used within university library organizations were structured for a number of clerks busily performing manual tasks such as keying a typewriter, or punching keyboards of desk calculators. Each clerk usually had different but specific limited duties. The old system is paced to human skills with the attendant shortcoming in fatigue, inaccuracy and limited span of attention. Errors, unfortunately were detected by assigning one person to review another's work. This became a rather expensive method of cross-checking accuracy of output.

Components of a Computer

The computer may be described physically as a desk top calculator differing from the latter in three main respects. The computer has a memory, it is faster, and it can make decisions based upon pre-determined criteria (set program guidelines). The principal components of the computer are:

1. One or more input devices such as a keyboard, punch card, magnetic tape or paper tape reader.
2. A memory, a device or material wherein are stored the coded instructions and numerical values pertinent to the problem being executed.
3. One or more output devices such as a card or paper tape punch, typewriter, online printer, magnetic typewriter, or an oscilloscope picture display.

4. An arithmetic and logic unit capable of addition, subtraction, multiplication and division, as well as sensing either a negative or zero value.

5. A control mechanism whose function is to control the sequence of events within the computer and to interpret and cause execution of special coded orders which the control unit receives.

The relationships among the five principals components of the computer may be illustrated by the following systems diagram.

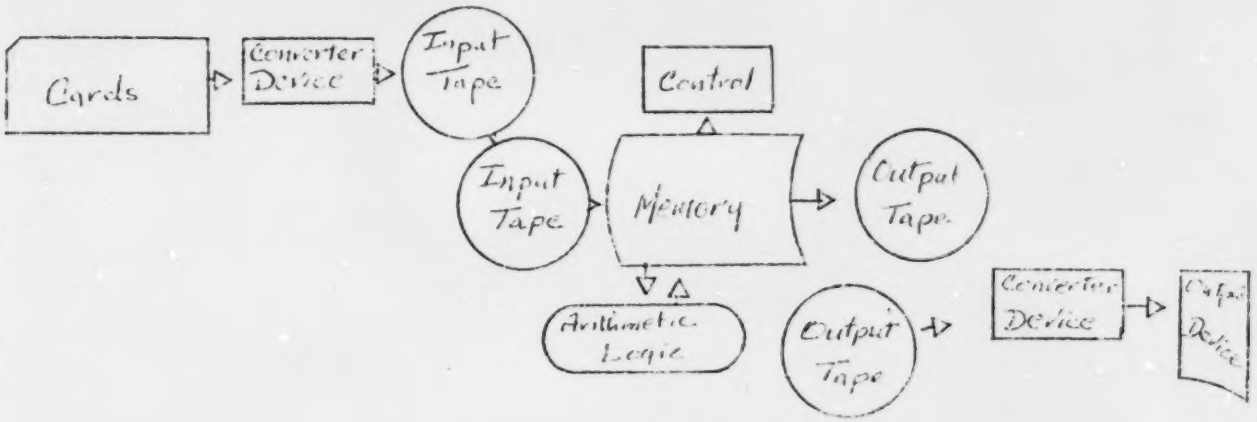

Diagram 1: Computer System

If we examine to some degree the process which occurs within the machinery of the computer during its actual operation we may draw intuitively conclusions as to its application to the needs of the educational film library. The key to the operation is the component referred to as the control unit. This device is capable of retrieving by nondestructive read-out the contents of words in memory, one after another and in a logical and rational manner. Each time information from a word of memory is brought to the control unit, it is analyzed and interpreted as a discreet instruction and is then executed by the computer. The act of executing an instruction involves calling into action one or several of the other

main computer components to solve the problem. If the instruction is an order or an instruction to perform some arithmetic calculation, the arithmetic unit and the memory may be involved. If it is an input instruction, the card reader or the input tape, if you will, is activated and information is channeled from the device to certain locations in the memory system which receives this information. The use of a computer involves a process which places in memory a sequence of instructions in the order in which they will be utilized in carrying out the operation of a library process. The system or sequence of instruction is like the business system presently used to carry out activities within the film libraries like those found at major U.S. universities.

(Each type of computer is distinguished by its own repertoire or list of instructions which controls the unit in the system capable of interpreting and executing instructions. Repertoire is generally fixed and is furnished as built-in electrical circuitry by the design of the machinery. In some machines there are several hundred different instructions in the repertory of the program.)

In studying the emergence of the idea involving application of electronic data processing to the film library's operation, re-design of each business system as a unified entity contributing directly to the business and educational goals of the lending service, is predicated upon the fact that it is necessary to take full advantage of the equipment proposed, its capabilities, as well as a fast developing new management science technique as

applied to film library needs. This will provide a real breakthrough for the librarian in taping the long unrealized potential of an outstanding data processing system for managing film library processes.

Advantages of Electronic Data Processing

There is a need for methods or techniques to improve all aspects of documentation found in commerce and technology. There seems to be three basic elements involved in a decision to move in the direction of electronic data processing. They include the size and the mass of documentation, the speed of transmission of information, and the ability to maintain and revise information at will. Therefore, the following advantages become evident in computer systems:

1. Computers operate at a very high incidence of speed.
2. Computers file and retrieve information in large quantities adeptly.
3. The computer has the ability to make decisions based on empirical data stored within its file.
4. A reduction in clerical cost occurs by applying basic routine to EDP.

Certain disadvantages, of course, are evident also. They are as follows:

1. Total computer mechanisms are costly ($25,000 to more than $2,000,000).
2. Professional assistance is required in handling information to be placed in the computers system.
3. Because it is a new and complex machine, personnel have a tendency to resist change fearing a direct threat to need for human assistance.

It is the consensus of many library directors that the advantages far outweigh the disadvantages. Therefore a recommendation to proceed with operational testing of the electronic data processing concept for the activities of film libraries has become tantamount in film library development and planning.

WILL A UNIFIED SYSTEMS APPROACH WORK

The program offered by the Cooperation of Universities and/or Computer Manufacturers must be viewed from the viewpoint of applying the unified systems approach to the environment which a computer system is to serve. As a comprehensive plan, an approach in methodology which reflects the operations of the total participating membership of universities may cause problems assuring failure. The approach in diversified application of many users for computers must be studied in order to achieve a better systems integration which is used for an imaginative organization of people working in a suitable educational management climate. Governance, priorities, organization and management of computer facilities will contribute to success or failure in use of the system by film libraries.

SYNTHESIS OF ELEMENTS IN COMPUTER UTILIZATION TO COLLECT, ORGANIZE, AND UTILIZE MOTION PICTURES

At this point it is desirable to synthesize information into a combination of parts or elements making up a whole unified system. I have drawn from a variety of sources such as present systems descriptions, a statement of present goals, a surface analysis of

demand for current and future products and services, and have discussed with management individual systems problems found in the selected computer applications. The information is organized and evaluated in terms of electronic data processing equipment selected by film libraries to provide more efficient and effective information for film library management.

Practice suggests that it is necessary to develop a simulation experiment with real film library conditions to actually test the value of electronic data processing in a film library organization. Certain decision rules may best be tested for validity over a range of situations and, therefore can best be evaluated for effectiveness in any given operation. There are existing models which can be used in testing various business systems. These models are: Queuing Model which investigates problems surrounding waiting lines, a Monte Carlo Model which provides the opportunity to introduce variable values into simulations for problems like production scheduling. There are also optimizing models which employ techniques of advanced calculus and statistical theory and are set upon linear programming logic.

It is my opinion that the computer itself presents certain economies and efficiencies because of its speed in operation, its ability to handle masses of files, and its ability to run for long periods of time without fatigue. This makes it a desirable addition to the operation which could uniquely serve educational film library needs.

Data processing is a technical operation which requires highly trained, technically competent, and in many cases creative, personnel. The combination of strict operating detail with creative development work imposes difficult supervisory relationships. Standards for control of data processing operations and planning are necessarily separate and unique from those of other functions. Because of computer installation which best serves the user provides for the major objective of integrating all management information systems, it is necessary to place a much heavier weight upon systems research and development and advance programming than would be necessary in installations whose prime objectives were the daily maintenance of accounting records. After defining data processing, consideration must be given to organizing an electronic data processing information service which contributes to five basic factors. These factors include:

1. Management purposes to be served

   How can the data processing activity contribute to planning and control of film libraries? Managerial functions which require data processing may be of extreme importance and thus include control and exception reporting, planning and research, and maintenance of the basic departmental files. Circulation, selection profiling and cataloging standardization can be well served in film library management.

2. Operational purposes must be served

   How does the data processing activity participate in the daily operations of the library? Can it control the output of the various departments in the library, economically and efficiently?

3. Scope of the service

Will the data processing activity provide for the needs of all departments in the library? Will it provide for the typical services needed, such as (a) pupil personnel accounting, (b) scientific and mathematical manipulation, (c) production distribution-records, library reference needs and (d) fiscal operations including payroll?

4. Means of Service

Will the activity operate on a closed-shop basis or will it operate as an open shop providing services to users other than those within the library?

5. Future plan

Will the data processing activity adequately serve the library plans for growth, service expansion and competition? Any major changes planned for the future must have a direct bearing on the data processing procedures to be adopted in a unified system.

Personnel Requirements

There are basically five levels of job families required for electronic data processing facility operation. They are in order of responsibility:

a. Management: Management must be located in a position where optimum responsibility for planning development and operation of the system meets the needs of the Division. Standards must be set and policed. Training specialists must be appointed and provide some kind of an educational program dealing with data processing and guiding the technical training of new and promoted employees. Of course, the computer Educational Centers will provide a great deal of training in this area. However, it is impractical to separate employees from operating situations for long periods of training away from the facility. Therefore, training must be accomplished by some organizations with the personnel available and already on the payroll.

b. Systems Analysis: Positions in this family are concerned with planning of new applications. Present professional staff can fulfill the need with assistance from the University's Computer Center and the manufacturer of the computer.

c. Programming: Programming functions occur at two levels - planning and operating programs. Skills are of technician level. Personnel will have to be trained or recruited for this function.

d. Machine Operation: Jobs in this family are concerned with the operation of data processing equipment. Keypunch operators are commonly available on the employment market. The skills in this family are closely aligned with skills of many clerical employees.

e. Clerical and Administrative: (See table 1 possible job assignments.)

The adoption of an installation involving use of data processing equipment will provide the following advantages to the film library:

1. Data will be made readily available for management decisions on inquiry.
2. When the computer is applied appropriately to educational data it will reduce the amount of professional time and energy previously devoted to clerical work.
3. It will reduce the unit cost of processing data in that it can be used to totally serve the needs of the service in the same given time period.
4. It will facilitate the development of new techniques, resources, insights, and processes not feasible under manual or tabulating machinery systems.

Therefore, film library managers acknowledged that the electronic data processing is a system which has a place in management of the library and must be applied to the day to day operation at an early date if survival in the competitive rental market can be achieved.

Table No. 1 : Summary of Estimated Business Costs (1967-70)

Input

BOOKING AND SCHEDULING

1.	Principal Clerk	468
2.	Sr. Clerk Typist	356
3.	Sr. Clerk Typist	356
4.	Principal Clerk	385
5.	Sr. Clerk Typist	356
6.	Clerk Typist	281

ADMINISTRATION

1.	Office Supervisor	569
2.	Principal Clerk	468
3.	Sr. Clerk Typist	356
4.	Clerk Typist	281
*5.	Secretary	356

TOTAL LABOR COST/month

without computer	$5046
with computer	4128
present	3491

Computer

Lease
$1435/mo.

Peripheral Equipment
$140/mo.

Total Mo. Lease
$1575.00

Department of Audio Visual
Extension Share
$859/mo.

Output

SHIPPING AND RECEIVING

1.	Principal Stores Clerk	563
2.	Sr. Stores Clerk	506
3.	Sr. Stores Clerk	468
4.	Asst. Comm. Technician	356
5.	Clerk	281
6.	Clerk	260

ACCOUNTS RECEIVABLE

1.	Sr. Account Clerk	568
*2.	Sr. Clerk Typist	356
*3.	Sr. Clerk Typist	356

TOTAL LABOR COST/month

without computer	$4023
with computer	3007
present	3719

POTENTIAL SAVINGS
$1934/mo.

* Present positions and positions that will be reassigned

WHERE DO WE FIND GUIDANCE IN BUILDING LIBRARY SYSTEMS

User services in libraries are those which patrons interact with as materials are requested from circulating collections to meet patron needs. Within this very broad structure this paper has attempted to deal with data processing and the educational film library. A review of automation applications with specified advantages and disadvantages as used in circulation and reference processes were briefly covered. The state of the art for automated circulation systems has progressed from emphasis on "what do we want and how can we do it", to "can we do what we want at an acceptable cost for my library", and "what decisions do we need to make about the functions we want to automate and those we don't want to automate".

Circulation system requirements are highly individualistic in systems working in educational film libraries in the United States. Multiple configurations of hardware and software are commonly found across the country, but standardized packages of automated systems for film library use are not readily available. Major systems in the academic and public print libraries in the country have evolved by concentrated research and development in difficult and sophisticated environments. (i.e., BALLOTS System at Stanford University, Ohio College Library Consortium System in Ohio, LIBRIS System in Sweden, The USA MARC II Project, the University of Utah, Bibliographic Services System and MINITEX at the University of Minnesota.)

Development has taken place within the limited political boundaries of a single library authority. System transfer at the functional levels of library operations has been accomplished as is evidenced in the IBM System 7 at Georgetown University, American University and the University of Pennsylvania. Transfer of experience with automation in the library structures eluded to serve as working models of success which are used in building and improving systems for educational film libraries. Applications of known systems are dependent on hardware capabilities most commonly categorized as off-line batch processing, on-line direct terminal connection, or minicomputer logic systems. The minicomputer system may offer control over film library circulation in a highly cost-effective manner when compared with on-line capabilities. The choice is, of course, an individualized one representing preferences of the individual library.

Any library desiring to automate must search for existing systems to accommodate known processing needs. Development costs of new systems in the 1978 labor market makes it impossible to step into individualized development of a system from ground zero. Because of the economic principles existing in the 1978 economy, systems may be selected and enhanced with special emphasis on the following considerations:

1. study cost-effectiveness of circulation operations.
2. study user response to curculation activities.
3. direct less development effort by individual libraries and more applications of systems offered by library oriented films.
4. work for great use of management reports.
5. work toward greater integration of circulation systems with processing systems.

6. change line responsibility of circulation departments from public services to processing services.

Generally, educational libraries implementing automated systems have not reduced personnel costs, but have maintained staff levels with a great increase in the capacity to handle larger volumes and additional functions.

Technological applications to the standardized processes in educational film library operations is an answer to the impact in costs imposed by expanding the labor force.

The "Classical Now" Educational Film Library Automated Systems in the United States

A brief description of seven large educational film library automated systems is offered as examples of applications serving a range of services. Five of the systems identified are working in educational film libraries which are members of the Consortium of University Film Centers. The chosen libraries have a uniqueness accomplished in 1978 by publication of a general Film Locator Guide by R.R. Bowker. The catalog data bases from the libraries have been standardized and worked into a union list of all holdings. The systems are described in the following paragraphs. A special case study presentation is made of the system developed at the University of Minnesota. The procedures used to acquire, develop and operate the system are highlighted. Cost facts and administrative relationships external to the library are specified. A case for revision is part of the case study presentation.

SCHOLASTIC INSTRUCTIONAL MATERIALS SYSTEM
Developed by
Burroughs Corporation for Use on Burroughs Computers

The Burroughs School Administrative Systems (SCHOLASTIC) Instructional Materials is a software product which manages the scheduling, distribution, and recovery of instructional materials and equipment. The system may be used at the level of a school district, a college, or any other organization that maintains and schedules bookings of instructional materials and equipment.

The system consists of 17 programs. Five programs are used to initialize, load, and perform file maintenance functions to an integrated data base. Six programs perform the daily batch mode operations of the system. Four programs provide reporting options which produce categorized information on bookings and usage of instructional materials and equipment. One program is a historical record clearing program that releases disk records from the Historical Bookings file and optionally writes them to a historical tape file. One program is a non-execution source file which creates COBOL disk library files that are copied and used by all the other programs in the system. All programs are written in COBOL and use FORTE /2 (*1) generated source code to manage an integrated data base.

NOTE

The FORTE /2 program applications license is not required to use SCHOLASTIC Instructional Materials.

The features of SCHOLASTIC Instructional Materials include:

a. A user controlled valid booking calendar which allows scheduling of bookings of instructional materials and equipment, year-to-year, with a 12-month scheduling window.

b. The ability for a requestor to specify a booking window for material in order to increase the probability of a successful booking.

c. The ability to specify a maximum and a minimum on the number of copies requested and the number of days used in the Material Master record.

d. The specification of the number of copies per item from one to 999.

e. The preparation of daily shipping lists and pick-up lists, by location, for distribution and recovery of materials and equipment booked for use.

f. User specified system title or district name on all output reports.

g. Extended description ability for any instructional material.

h. Eight-character material identification including a user-specified 2-character media-type classification.

i. Multiple school district file labeling and processing.

j. Booking request confirmations coordinated with materials delivery system schedule.

k. Demand materials current usage lists.

l. Overdue materials reporting and historical materials usage summaries.

Basic cost data for system follows.

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1 FORTE /2 is a service mark of Burroughs Corporation for File Organization Programming Services (File Organization Techniques).

B1714 ELECTRONIC DATA PROCESSING SYSTEM

QTY.	STYLE	DESCRIPTION	MONTHLY LEASE	PURCHASE	MONTHLY MAINTENANCE
1	B1714	Basic Processor, 4 MHZ 16,384 Bytes Memory	$780.00	$34,225.00	$95.00
1	A9340	Console Printer	55.00	2,640.00	15.00
1	A1340	Console Printer Control	60.00	1,800.00	5.00
1	A9319-4	Card Reader/Punch	310.00	11,190.00	91.00
1	A1319-4	Card Reader/Punch Control	70.00	2,300.00	11.00
1	A9240-1	Line Printer	475.00	19,500.00	174.00
1	A1240-1	Line Printer Control	50.00	1,400.00	9.00
1	A9381-22	Two Station Tape Cluster	700.00	33,600.00	205.00
1	A1381	Tape Cluster Control	250.00	6,000.00	38.00
1	A9481-2	9.2 Million Disk Cartridge	480.00	21,600.00	72.00
1	A1481	Disk Control	100.00	3,500.00	15.00
		TOTAL	$3,330.00	137,755.00	$730.00
		Less 20% Educational Discount	-666.00	-27,531.00	
			$2,664.00	110,224.00	
1	B1710 MP1	Master Control Program	-0-		
1	B1710 COB	COBOL Compiler	50.00		
1	B1710 RPG	Report Program Generator	50.00		
1	B1710 FOR	FORTRAN Compiler	100.00		
		GRAND TOTAL	$2,864.00		

NOTE: Maintenance charges apply to a purchased system only.

B1714 ELECTRONIC DATA PROCESSING SYSTEM

STYLE	DESCRIPTION	SPEED
B1714	Central Processor	4 Million Cycles/Second
A9340	Console. Printer	15 Characters/Second
A9319-4	Card Reader/Punch (96 Column Cards)	500 Cards/Minute, Read 120 Cards/Minute, Punch 120 Cards/Minute
A9240-1	Line Printer (132 Print Positions)	475 Lines/Minute
A9381-22	Tape Cluster (2 Tape Drives)	36 KB Transfer 800 BPI
A9481-2	Disk Cartridge (9.2 Million Bytes)	90 ms Average Access 193 KB Transfer

SYSTEM OVERVIEW

DATA PROCESSING

FILM BOOKING AND RELATED PROGRAMS

University of Iowa
Iowa City, IA

The Audio Visual Center at the University of Iowa requested that Data Processing develop a more automated way to do the film booking and update of the film title and customer files.

After some deliberation and analysis of the problems it was decided that teleprocessing would help out very effectively. In addition to the teleprocessing there were also several procedures that could be done in regular data processing fashion.

The Teleprocessing Programs would be:

1) Automated Film Booking and Returns
2) Customer File Control
3) Film Title Update

The peripheral jobs that would be done in more conventional data processing procedures were:

1) Print Confirmation Notices to Customers
2) Print Labels for Shipping
3) Monthly Billing and Accounts Receivable
4) Accurate Analysis of Film Usage

There is one other application that is not closely associated with present methods; that is the printing of the film catalog by computer. This was done last year and our present methods of film update will make it easier to maintain for future printings.

System Highlights:

1. Film information is current and immediately available for inquiry and booking, either by telephone or mail.
2. Shipping time is automatically calculated on the basis of destination and zip code and added to reservation time.

3. Late or non-returns are tracked to ensure proper inventory control and billing.
4. Separate shipping and billing addresses provide direct shipment to user and central itemized billing to schools or school systems.
5. Automatic rental fee calculation.
6. Automatic rotation of film prints provides even usage of all prints.
7. Independent billing system.
8. 420-day reservation cycle.
9. Comprehensive file maintenance facility.
   Online record creation, updating and inquiry
   File backup and recovery
10. Optional volume discounts are automatically calculated and applied to invoices.
11. Computer-printed output.
   Confirmation notices
   Shipping labels
   Billing invoices
   Overdue notices
   Cancellation notices
   Daily activity log
   Customer analysis
   Vendor/distributor analysis
   Film usage analysis
   Denial history for each title

Film library considerations
Operational cost savings

Eliminating or vastly reducing the heavy paperwork burden is the objective of every film Library. FLMS provides for substantial savings of manual clerical effort. The customer records and film catalog files are created once and then are retrieved on the display terminal for updating or use. Bookings are done online with a minimum of effort.

A special feature of the system is a user-specified formula that automatically calculates rental fees based on amortized purchase prices plus postage and overhead. This is used when films are added to the library, when preparing the catalog, or when postage fees are increased. All paperwork is produced by the computer.

In addition to the clerical savings, considerable reduction in space and file equipment can be realized. In the first year of operation, the University of Iowa Audio Visual Center experienced a 40% reduction in clerical effort while film bookings increased.

Growth Flexibility

FLMS can handle growing business volumes without commensurate cost increases. Peak volume transactions can be entered on other terminals at Iowa. Growth adds to the size of the central data file, not manual filing systems. In addition, FLMS can be used to incorporate other media such as audio tapes, slide sets, equipment, or even personnel. The film catalog file, already in machine-readable form, is used by Iowa as a basic building block for catalog preparation.

Customer Service Improvement

The reduction of human errors and the ability to give rapid responses are the keys to improving customer service. FLMS has several features that enhance customer relations.

FLMS shows at a glance whether a film is available on a given date. Since there is only one central file, two clerks cannot book the same films.

Confirmation notices can be mailed within 24 hours, addressed to the attention of the specific film user. A variety of messages can be written on notices and invoices by the computer. These messages are coded in the system and initiated from the terminal, eliminating most manual correspondence.

Requests to reschedule or cancel orders are simplified through retrieval of the customer's pending schedule on the display terminals.

Billing is more accurate and prompt because it is automatically calculated and printed, including credits and special charges.

Inventory control is more accurate. FLMS provides mailing labels for positive control of film movement from the library. It also produces a punched card turnaround document for positive control over the checking in of films.

Data Processing Considerations
CICS support

For the current CICS user, FLMS does not require a separate partition and can be run with a minimum of additional overhead. For others, FLMS provides an initial base of productivity while other CICS applications are being added. Multiple display terminals are easily supported; no programming is needed at the BTAM or QTAM level. The online portion of FLMS consists of:

1. 9 program modules (largest is 4K)
2. 3 tables
3. 4 ISAM files
   Film Title (191 bytes/print)
   Customer Master (160 Bytes/customer)
   Matrix Scheduler (70 bytes/print)
   Customer Schedule & Film Usage (124 bytes/booking)
4. 2 SAM files
   Backup
   Activity Log

Systems Throughput considerations

Presently at Iowa, the daily background processing is done after the prime shift and requires about 25 minutes of elapsed time (1.5 minutes CPU time) on a S/370 M155. Iowa maintains master records

on over 4,200 titles (8,000 prints) and 10,000 customers. They confirmed over 33,000 bookings in 1971-72.

Volume Changes and Growth

Peak volumes have little effect on data processing. Because FLMS runs concurrently with other CICS applications, any other CICS terminal can be used. All file changes and updates are done online by film library personnel.

SYSTEM OVERVIEW

EDUCATIONAL FILM LIBRARY

AUTOMATED SYSTEM

University of Illinois
Champaign, IL

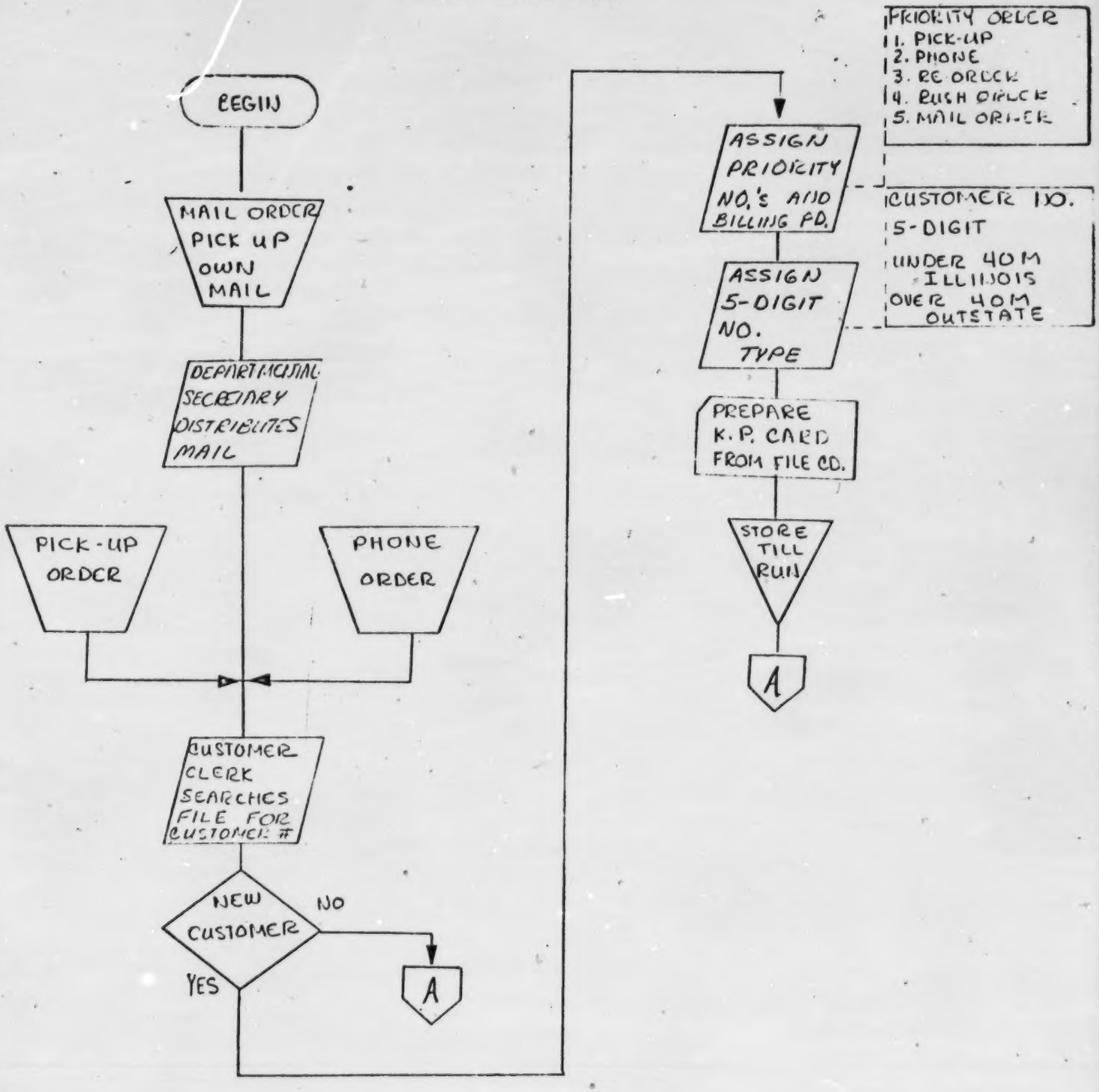
Planning for the Illinois System began in 1961. Advance planning was based on findings identified at the University of Wisconsin and Syracuse University. Both Universities had partial computerization for their circulation system. By early 1963, the newly designed Illinois System was well developed and ready for implementation. A sudden crisis in the data processing program of the University caused a large scale change in DP personnel in 1963. The project was forced to be delayed for three years.

After the delay restudy and redesign took two years. The revised system went into operation in April of 1968. Under the newly designed system problems such as late returns, change in dates already confirmed, cancellations, extended booking dates and more were automatically handled through standardized procedures on the computer. Up-to-date statistical data was generated to assist management in effectively making decisions about the operations.

To make the new system work many modifications in establishing the catalog and customer data bases were needed. Account numbers, call numbers, sequencing information and codification were keyed into the system. Preparation for the operation was systematic and time consuming.

UNIVERSITY OF ILLINOIS
VISUAL AIDS SERVICE

OPERATIONAL FLOW



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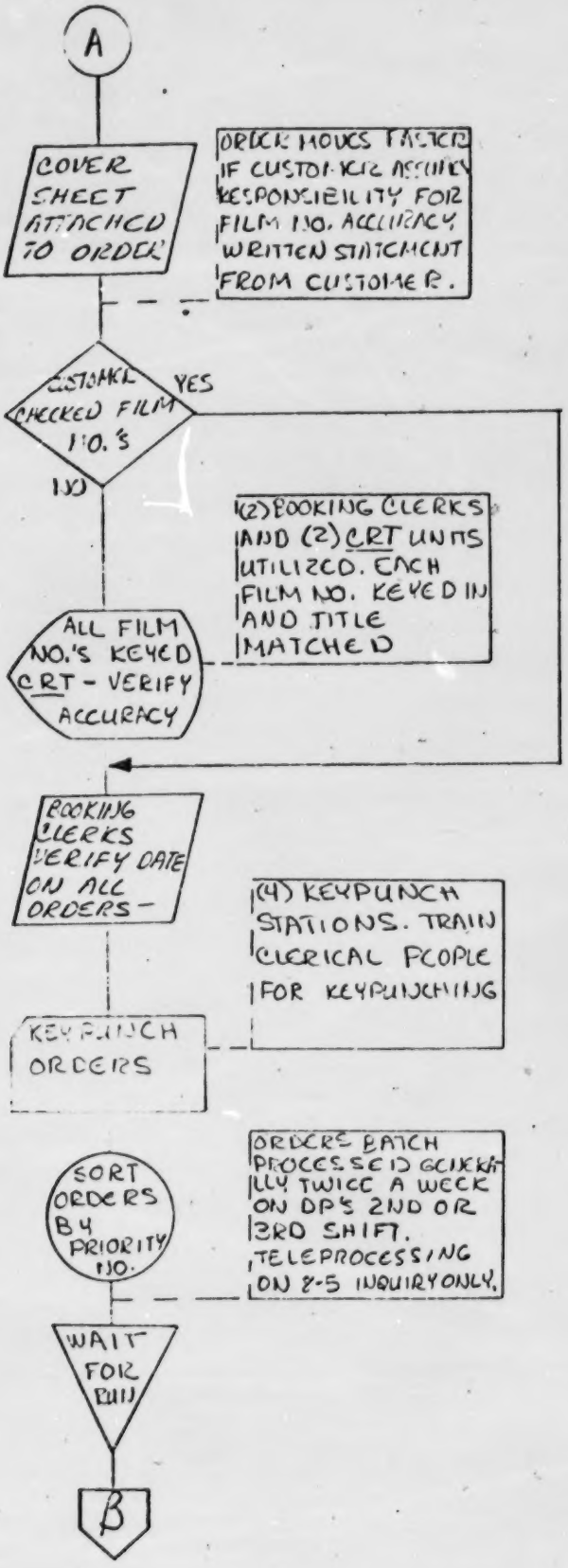
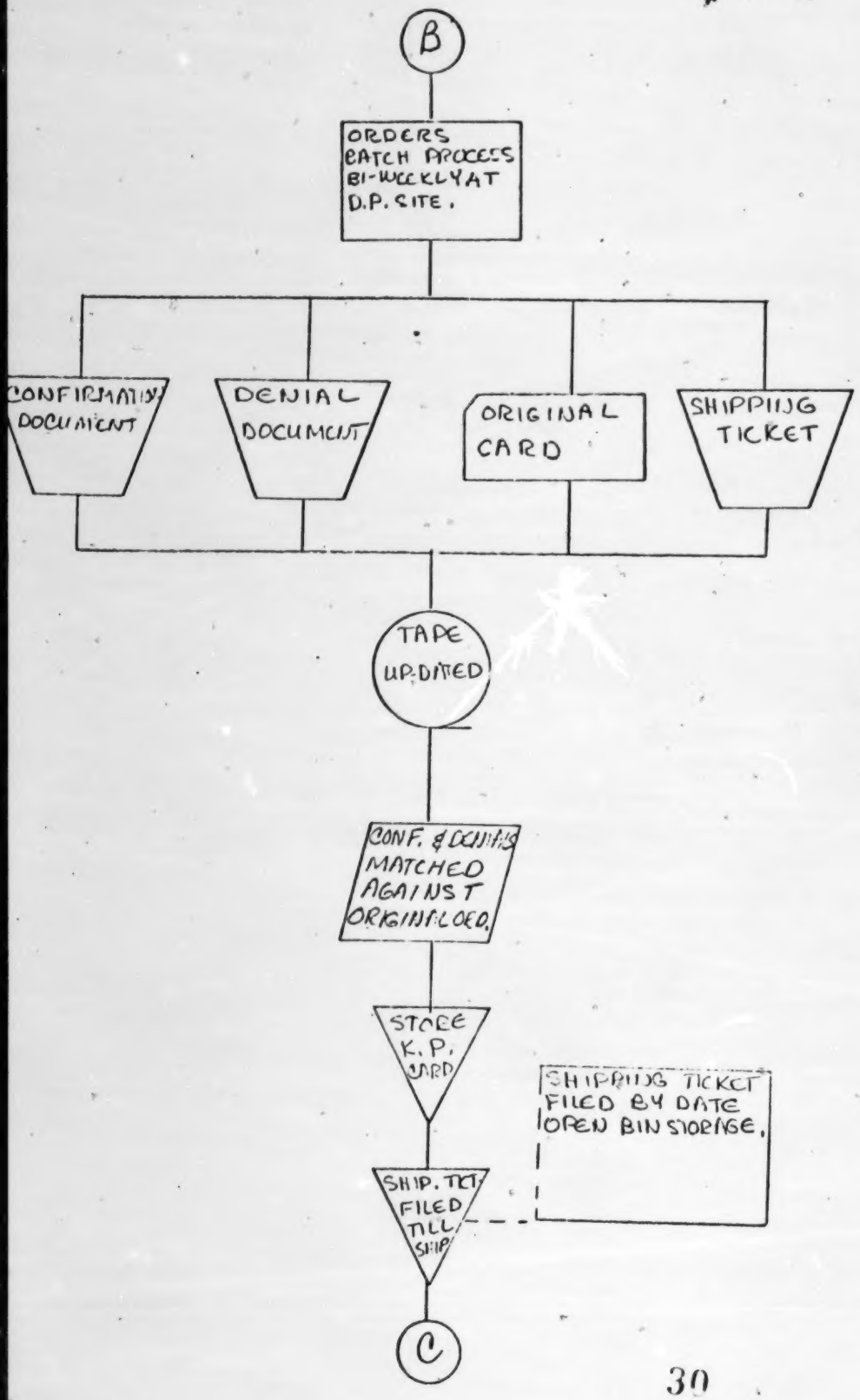

A
COVER SHEET ATTACHED TO ORDER
ORDER MOVES FASTER IF CUSTOMER ASSUMES RESPONSIBILITY FOR FILM NO. ACCURACY WRITTEN STATEMENT FROM CUSTOMER.
CUSTOMER CHECKED FILM NO.'S
YES
NO
(2) BOOKING CLERKS AND (2) CRT UNITS UTILIZED. EACH FILM NO. KEYED IN AND TITLE MATCHED
ALL FILM NO.'S KEYED CRT - VERIFY ACCURACY
BOOKING CLERKS VERIFY DATE ON ALL ORDERS -
(4) KEYPUNCH STATIONS. TRAIN CLERICAL PEOPLE FOR KEYPUNCHING
KEYPUNCH ORDERS
SORT ORDERS BY PRIORITY NO.
ORDERS BATCH PROCESSED AUTOMATICALLY TWICE A WEEK ON DP'S 2ND OR 3RD SHIFT. TELEPROCESSING ON 8-5 INQUIRY ONLY.
WAIT FOR RUN
B

CJL :NOV:72



CONFIRMATION -

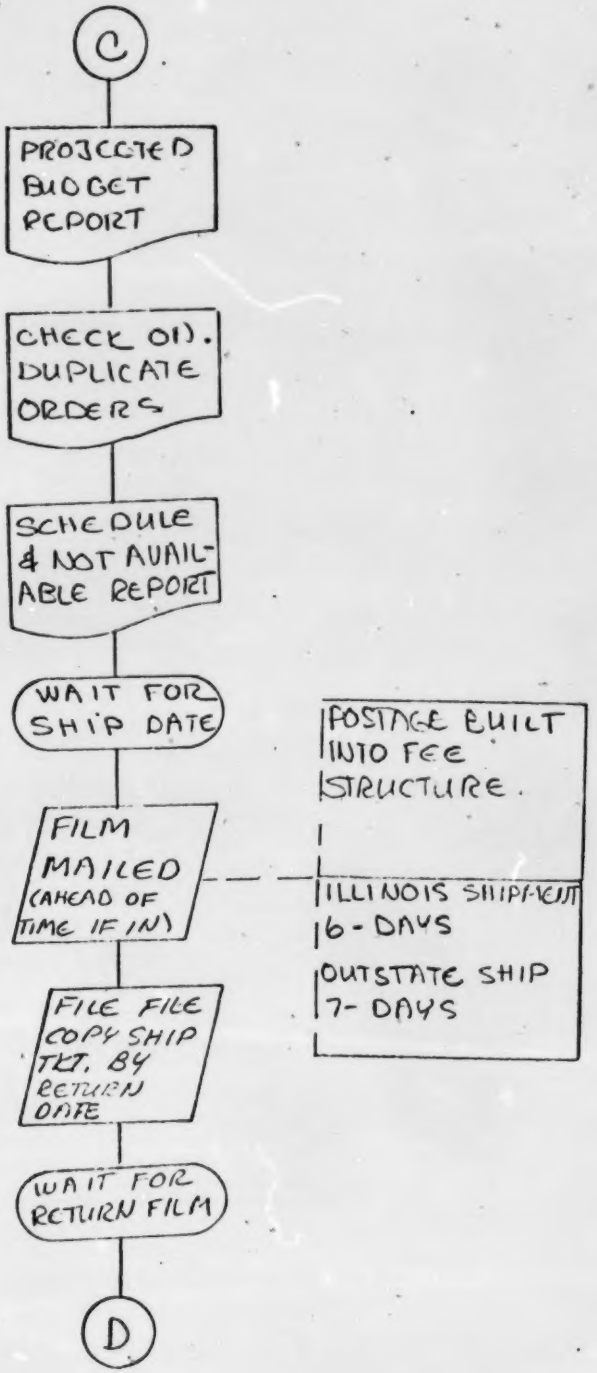
2-PLY. 1 COPY TO CUSTOMER. 1 COPY FOR FILE AND STAPLED TO ORIGINAL ORDER. SAMPLE ATTACHED, RETURNED IN CUSTOMER NO. SEQUENCE.

DENIAL -

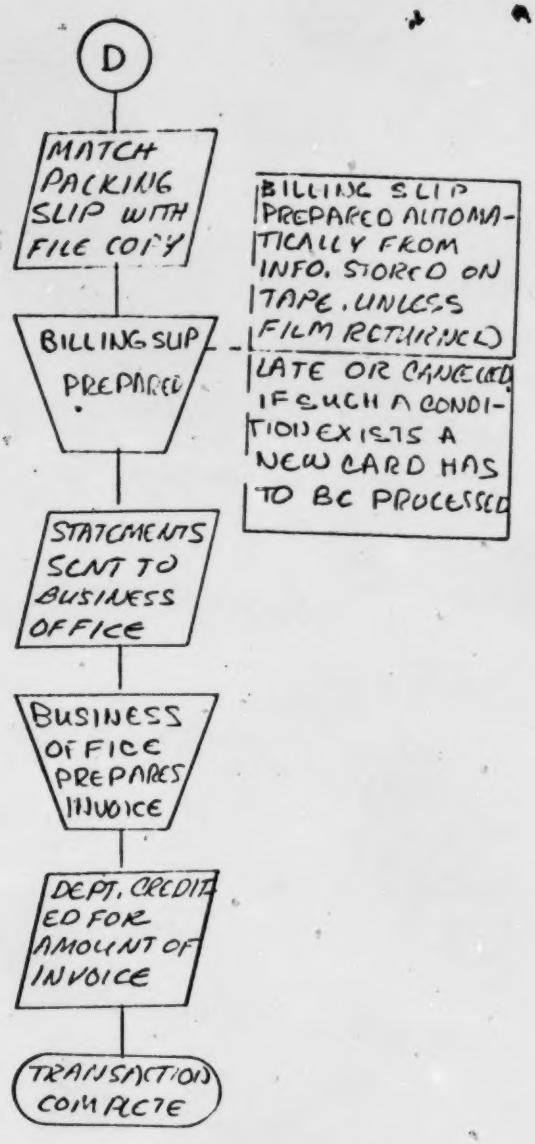
SINGLE PLY SENT TO CUSTOMER INDICATING WHICH FILMS NOT AVAILABLE CUSTOMER NO. ORDER SAMPLE ATTACHED

SHIPPING -

3-PLY. ADDRESS, PACKING SLIP AND RETURN FILE COPY. SAMPLE ATTACHED. RECEIVED IN SHIP DATE ORDER.


C
PROJECTED BUDGET REPORT
CHECK OUT DUPLICATE ORDERS
SCHEDULE & NOT AVAILABLE REPORT
WAIT FOR SHIP DATE
FILM MAILED (AHEAD OF TIME IF IN)
FILE FILE COPY SHIP TKT. BY RETURN DATE
WAIT FOR RETURN FILM
D
POSTAGE BUILT INTO FEE STRUCTURE.
ILLINOIS SHIPMENT 6 - DAYS
OUTSTATE SHIP 7 - DAYS

CJA :NOV:72


D
MATCH PACKING SLIP WITH FILE COPY
BILLING SLIP PREPARED
BILLING SLIP PREPARED AUTOMATICALLY FROM INFO. STORED ON TAPE. UNLESS FILM RETURNED LATE OR CANCELLED IF SUCH A CONDITION EXISTS A NEW CARD HAS TO BE PROCESSED
STATEMENTS SENT TO BUSINESS OFFICE
BUSINESS OFFICE PREPARES INVOICE
DEPT. CREDITED FOR AMOUNT OF INVOICE
TRANSACTION COMPLETE

The system was designed to run on the central university IBM 360-50 hardware. Initial operations called for batch processing with an intent to use telecommunication techniques later in the implementation plan. Documentation of the system is not readily available, however a general flow charting of system is illustrated in the following pages. Improvements have been added over the last several years. (i.e. CRT units for customer file number verification, CRT display of title activity on the file, etc.) The director of the Illinois Visual Aids Service advises that replacement of the system with a new system is being studied in 1978.

NOTES ON CUSTOMER FILE:

CUSTOMER CLERK - Clerk typist II. Clerical type person with rudimentary typing skills. Key position in system.

SHIPPING ADDRESS - consists of a 4 line address fixed length record. Each line consists of 40 spaces with a total record of 160 characters.

BILLING ADDRESS - consists of a 3 line address fixed length record. Total record length is 73 characters (32,22,19). Since the University Accounts Receivable Department prepares the statements for the department, they use the business office format for the customer billing record.

CONFIRMING ADDRESS - a separate or third address is typed on the back of the card if the confirming address is other than the shipping address. The card format is the same as the shipping card.

FILE STORAGE - all addresses are stored in sequential order on tape. The record is coded in storage to allow for the flexibility of having three separate addresses. The customer file is up-dated every run prior to film scheduling (generally twice a week).

UNIVERSITY OF ILLINOIS VISUAL AIDS SERVICE
GENERAL PHILOSOPHY

RENTAL PERIOD - Basic rental period is 2 days. The customer can keep the film for 5 days in the same school week for no additional cost, if requested at time of scheduling. If there are intervening weekends between scheduled dates, there are multiple charges.

LATE CHARGES - Minimum charge for a late film is $5.00. University of Illinois allows 6 days shipping time for areas in Illinois and 7 days shipping for out of state.

RENTAL FEE - The basic rental fee contains an allowance for shipping and handling charges. The invoices do not reflect specific charges.

CUSTOMER SERVICE - At the University of Illinois they handle very few telephone orders or pick-ups. Whenever possible they discourage this practice. At this point in their operation, they feel the customer must bend to their desires and not the other way around. Their volume of every day work is less than ours. They feel it is adequate to only batch process customer orders twice a week. If they have to confirm something right a way for someone who has come to pick up a film, they confirm it and place their

order in the batch process with a number 1 priority preceeding any other orders that might have been made prior to scheduling.

FILM LIBRARY - They do not handle most of the campus films. Only if someone on campus wants a particular extension film do they book for campus use. They do not schedule any equipment for campus use either. Their film numbering system does not have any provision for subject classification. They feel this practice is a waste of time. Their numbering system is based upon the size of the film:

0-50,000	400 ft. reels
50-70,000	800 ft. reels
80-90,000	1200 ft. reels
90-100,000	1600 ft. reels

All black and white films and color films of the same title have different film numbers. If a film title is destroyed or removed from the library the number is never filled again with a new title.

Whenever they buy a new title they always buy the header footage immediately and store it in their equipment and maintenance room. They feel, they are able to save money from bookings because most of the time they have the replacement footage already on hand.

When the Visual Aids Service decided it would be feasible to automate their system, they called in their data processing center to analyze their situation. The DP center did an analysis of the situation and prepared a proposal bidding the system. The Central Administration acted upon their recommendation and gave the data center the go ahead. All development costs for the system were provided by central administration funding plus support from the data processing center. The department was free of financial responsibility.

Only when the system became operational did the department assume financial responsibility. They pay for batch processing and TP time for their CRT inquiry system. They have a systems analyst who is attached to the data processing center who is in charge of the data processing element. If the department has any problems or future applications, they deal directly with this analyst. At present they are very pleased with their system and there are no immediate plans for any modifications or additional applications.

When it came to re-educate the staff, the data processing center assumed the responsibility. They trained all the people on 2nd shift and provides them with manuals that the data processing center developed.

The department initially became operational only through batch processing. They got CRT capabilities over two years later. They advised very strongly against any such procedure. They found it impossible to keep up with the mess of paper work necessary with no inquiry capabilities. They would dump a new calendar (film calendar) whenever a film was scheduled. They had to manually file these mounds of cards in order to know what was happening and in order to facilitate customers on the phone and those who would walk into the office.

Their system, I believe, produces a great amount of paper work and in turn generates a great deal of manual labor.

SYSTEM OVERVIEW

BUREAU OF AUDIO VISUAL INSTRUCTION

University of Wisconsin
Madison, WI

The computerized educational film library system for BAVI at the University of Wisconsin replaced data processing equipment. The system is a Singer System Ten. The configuration of the computer is:

1. CPU - 30K Memory
2. Two Disk Drives
3. Line Printers
4. Two Work Stations/Key Entry Devices
   Singer System Overview.)

The implementation schedule was completed in March, 1972. However, parts of the system was in use prior to the schedule acceptance date.

Perhaps the best way to look at this system is by discussing each of the five applications that make up the entire system. The five applications are:

1. Booking, Reservations and Inquiry
2. Preparation and Shipping
3. Returns and Miscellaneous Charges
4. Billing or Statements
5. Reports

The first of these applications, Booking, Reservations and Inquiry, is the most important and the most detailed. This application will, using orders that are mailed, phoned or carried to BAVI, and after editing, search a Booking Master File to either confirm or reject films that are requested for future use. Data such as: customer number, film number, and requested date will be entered through the work stations.

If requested dates and films are available, the booking will be made. If they are not, the request will be set aside until a reservation search can be made. Three files will be on line during this operation. They are: Film Title Master; Calendar availability; and Customer names and address. As films are booked we will create a fourth file, the Shipping File. This file will be used in later operations, such as, shipping, returns and billing. We will also create a temporary Work/Print File which will be used to print out confirmations of bookings to customers. Those bookings which can not be made will be processed in the reservation operation, for alternate use dates. If reservations can be made for alternate dates, the customer will be notified of these, in the hopes that they in turn will be booked.

Weekly and daily, the Shipping File will be searched for all bookings that are to be shipped in that week or for any given day within that week. Shipping documents will be prepared, and the shipping record will be coded to that effect. After shipment we need to re-enter the system, via work stations, the print number of the film that was actually shipped.

The third phase of this system is Returns and Miscellaneous Charges. As films are returned to the library, they are billed out to customers. In addition to film rental charges, there are several miscellaneous charges, such as: operators, equipment, and sales. These must also be billed to the customer. The customer is billed once a month on a statement. After billing, payments are recorded. The billing and payment transaction will be kept on two

files, known as: (1) open items and (2) customer receivable master.

The final application has to do with several types of service and sales reports.

In all, there are nine (9) master files and nineteen (19) programs to the system. For additional information, please refer to the attachment which consists of:

File List

1. Film Title Master
2. Calendar availability
3. Customer name and address
4. Shipping
5. Confirmation
6. Reservations
7. Open items
8. Customer Receivable Master
9. Film Master

Program List

1. Availability Inquiry
2. Booking
3. Reservations
4. Shipping Inquiry
5. Shipping Documents
6. Confirmation Print
7. Reservation Print
8. Returns & Miscellaneous Charges
9. Payment Posting
10. Statement Posting
11. Open Item List
12. Customer Master Update
13. Film Master Update

14-19 Reports

Singer
System Ten

OVERVIEW

WANTED: A small- to medium-scale business computer, flexible in terms of available peripherals, extensive communications capabilities, available on turnkey, competition for IBM System/360, System/3 and must be low cost, must not have operating system.

No operating system? In a third-generation machine that competes with IBM's 360/40?

In a world where the relationship between operating system software and hardware is finally being understood and developed, Singer has produced an operating-system-less computer that not only is selling well but has an impressive array of very satisfied customers.

Singer's System Ten is small- to medium-scale business computer used both by small businesses that do not need or cannot afford larger computers, and by very large organizations with scattered work locations needing a network of on-site terminals to provide input to larger computers.

What characterizes users in almost all cases is that jobs being run on the System Ten are all of equal priority and are, for the most part, continuous (in-house data capture, such as retail sales and inventory monitoring).

What characterizes the system in most cases is its comparatively modest cost and its flexibility and ease of operation.

The simple message is: If you want to run programs of equal

priority, or remote processing, or with a remote job entry terminal, there probably is no system better able to give equal weight to all jobs.

System Ten's ease of operation means that little training is required for its standard and special-purpose I/O terminals to be used by clerical personnel, sales persons, factory workers, hospital orderlies, and others. Users report as little as 2 hours are needed before a previously untrained person can comfortably use the system. Part of the ease of use comes from the fact that the System Ten does not have an operating system; therefore, there is no "operator", per se.

The System Ten is flexible. It provides time sharing and on-line information storage and retrieval with up to 20 simultaneous users and 200 I/O devices on one system. It can serve as a remote processor and I/O terminal for a larger central computer such as an IBM System/360 or 370. The System Ten can combine batch processing with time sharing operations and offers multiprogramming.

The System Ten is available on a turnkey basis, complete with either standard or some customized application packages. A comprehensive set of utility routines facilitates programming. This includes routines for program loading, card and paper tape reading, punching, verifying, and duplicating. In addition, common calculating routines are available, as are sorting and merging programs for both disc and magnetic tape, and computer-to-computer communications programs.

Languages available are RPG and Assembler.

The availability of special-purpose peripheral equipment, which

replaces such devices as automated time clocks and semiautomatic merchandise checkout terminals also lends flexibility to System Ten. Special-purpose peripherals include employee badge readers and cash-register-type terminals with merchandise tag readers.

The System Ten's flexibility is due to the modular design of the system architecture. The multiprogramming is provided by a round-robin, time slicing priority system that is monitored by hardware without the use of an operating system. Plug-in 10K increments of core memory expand the system from the smallest configuration up to a total of 110K. Simple 2-wire connections hook up I/O terminals up to 2,000 wire-feet away from the central processor.

System Ten's field expandability means that operator stations or more storage modules can be added at the installation sit without interrupting the operation. As a result, users can start out with small systems and expand to larger configurations as needed.

Although Singer itself is only a recent entrant to the ranks of computer suppliers, its Friden division, which originally manufactured and sold System Ten, was founded in 1934 and is currently one of the largest manufacturers of desk calculators and accounting machines. As a result, Singer has an excellent understanding of the data processing needs of the business community, considerable expertise in manufacturing equipment to meet those needs, and detailed knowledge of the specific requirements of its accounting machine customers, many of whom may be considering a change to electronic data processing.

SYSTEM OVERVIEW

MIDDLE IOWA EDUCATIONAL COOPERATIVE CONSORTIUM

MIECC

I. Introduction

The MIECC Media catalog and reservation system was designed and implemented by the MIECC staff in cooperation with the Heartland Education Agency Media Center. It was designed around a random access database containing media titles, annotations, school names and delivery schedules, reservations and reservation calendars.

At least one CRT terminal must be available to operate the master update and reservation program as not all transactions can be entered in batched data mode.

After each days reservation processing is finished the daily report programs provide:

-- Gummed labels for media leaving media center
-- Delivery lists
-- Reservation confirmation lists
-- Returning Media Lists
-- Overdue lists

On demand reporting includes catalogs, media usage, and media master lists.

Hardware requirements:

1. The master update program. Med10. Uses up to 30,000 words, 1,800,000 characters) of main memory.
2. Database files occupy approximately 40 million bytes of disk pack.
3. Daily reports can be printed on a printer with an eighty character print line. Usage reports and master lists require a 132 character line.
4. One or more CRT terminals with at least a 960 character display are required. Forms control characters used

are the left and right brackets (hex 4A and 5A), and the standard data-comm. one clear. and clear one characters are used.

5. No tape drives are used for production programs. Utilities are used to back up or restore diskpack files.
6. No card reader is designed into the system. Batch input may be loaded by a utility card or tape-to-disk program for input to the master update program.

Database File Contents:

All records in the system are identified by 4-digit area or media center number. Since it is implied throughout the system it will not be mentioned in the individual file descriptions. Each media center being processed is treated as though it is the only one in the system.

Following are the descriptions of the six random access files contained in the "Forte" (Burroughs file handler) database:

TITLE FILE

Key is seven digit media number.

1. Media type - two characters - up to 20 different types may be defined. Fourteen types are currently recognized.
2. Dewey classification - digits with an implied decimal 3 positions from the right.
3. Title - up to 44 characters.
4. Title sequence - ten characters. When used it replaces the title for use in alphabetic sequencing.
5. Author - 12 characters - required for printed media only.
6. Producer name - 17 characters - usually applies to film.
7. Year of production, copyright.
8. Grade level(s) for which the title is suited. One or more of five levels may be shown: primary, intermediate, junior or senior high, and adult.
9. Number of copies of this title, 1 - 99.

10. Price (cost) of single copy in whole dollars.
11. Source of funds. Two characters to be defined by the user.
12. Color or black and white - does not apply to printed media.
13. Subject area codes. Three 4-digit fields to be defined by the user. System requires that one or more be non-zero.
14. Kit list. An array of 20 3-digit fields to record the number of each type of item making up a multi-media kit (type "MM").
15. State booking number. Seven alphanumeric characters that may contain a state assigned book number if needed.

School File

Identifier key contains 4-digit district number and 4-digit building number .

1. School Name - 30 characters.
2. School address - 30 characters.
3. City-State-Zip - 35 characters.
4. Route number - 3 digits.
5. Weekly delivery schedule. One character for each day from Monday thru Saturday.

Note: Fields 2 and 3 are not required.

Single Copy File

An individual record exists for each copy of media and is identified by media number and copy number.

1. Code to indicate active or hold. A copy on hold cannot be reserved for delivery but previously made reservations are still in effect unless cancelled.
2. Control number of the current reservation for the copy if there is one.
3. Control number of a pending reservation if the copy has not been entered as returned from the previous user.

Calendar File

One record represents one year for one copy. Identifier key contains copy number and a 2-digit year. More than one calendar record may exist for a copy by each being for a different year.

The calendar contains a digit for each day of the year. Value four indicates holidays and weekends. Zero indicates available days, and ones or twos indicate days the copy will be in use.

Reservation File

Identifier key is a unique 6-digit control number assigned sequentially as the requests are entered and the reservations are created.

1. District/building number of the school making the request.
2. Name of teacher making the request.
3. Date the media item is to leave the media center.
4. Date the media item is to return to the media center.
5. Identifier key of the media item.
6. Number of work days the item will be at the school.
7. Delivery mode - pickup - van delivery or walk-in.
8. Date for which the request was made initially.
9. Date the request was processed by the system.
10. Status of the reservation. Future, not available, returned, or cancelled.

System Output

The extracting of information for printed reports must be done while the master update program is not running. The printing itself may take place at any time.

Normal Daily Reports Include:

1. Media labels - to be applied to the items leaving the media center.

2. Van request list - items to be loaded for delivery the next working day sequenced by route, building number, and media number.

3. Media center request list - same items as above but sequenced by media number and school number.

4. Confirmation list - shows all request confirmed or denied since the last confirmation listing. Sequenced by route, building number, teacher, request date, and media number.

5. Cancellation list - all reservations cancelled since last cancellation list. Sequenced by media number.

6. Van return list - items due to return via van on the next working day. Sequenced by route, building number, teacher, and media number.

7. Media center return list - all items due to return on the next working day. Sequenced by media number.

8. Van overdue list - delivered items between 3 and 14 days overdue and not before listed on an overdue list. Sequenced by route, building number, and media number.

9. Media center overdue list - all items between 3 and 14 days overdue and not before shown as overdue. Sequenced by media number and building number.

10. Accrued overdue list - all items 14 or more days overdue. Sequenced by return date, media number, and school number.

SYSTEM OVERVIEW
EDUCATION FILM LIBRARY SYSTEM
SHELL OIL COMPANY
Indianapolis, IN

A system developed by the Paulmar Corporation has been acquired to handle the film library processes for the Shell Oil Company. The system was designed to address the following key areas:

-- Customer service
-- Staff productivity
-- Inventory control
-- Market development and growth

The system design stressed maximum benefit to the library as a management tool: efficiently collecting organizing and delivering information about daily operations at a reasonable relative cost while still facilitating growth. A circulation volume of 218,000 is being handled through the system.

COMPUTER SYSTEM COMPONENTS: The described computer system may be configured in many flexible arrays of component alternatives. The following component options with varying degrees of sophistication in components are possible:

-- Disk drives
-- Terminals
-- Central processing units
-- High speed printers
-- Magnetic tape drives
-- Special input devices
-- Communications equipment

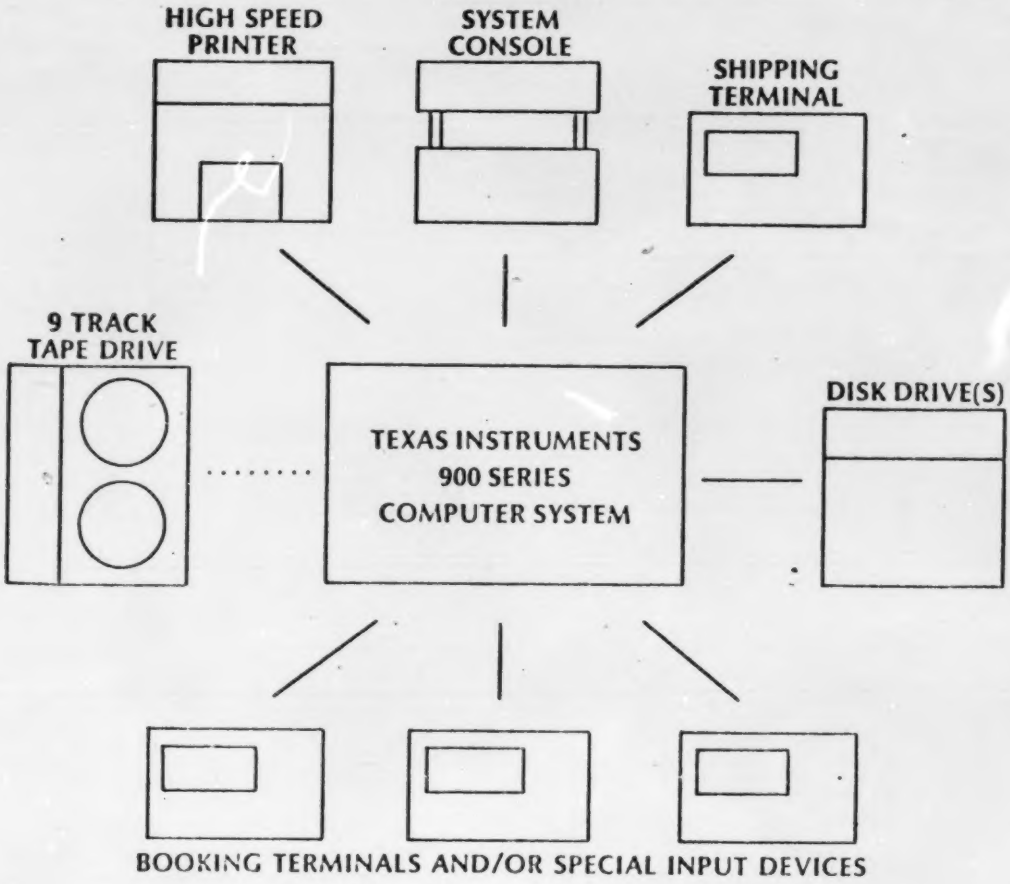


Diagram 2. Typical FILMS System Equipment Configuration

The software is designed to guide staff step-by-step through each film operation. "Menus" of processing alternatives are presented on the video terminal screen. The operator selects from the displayed alternatives to meet requested action steps.

The System then proceeds with prompting messages to guide library aid to completion of process evolution. Each phase of the operating module collects and validates data for processing. Depending on the

application, information may be keyed in at the terminal by an operator as variations in decisions demand. Errors are detected by the System and prompts are furnished on the display devices.

A basic advantage of the computer system is its ability to store information once and use it repeatedly for many purposes. For example, customer addresses used for shipping may also be reused for invoicing and promotional mailings. Inventory data for scheduling reservations will also be used for statistical reports.

It is claimed that a complete solution to the film library management process is available on this system. Among the major functions are:

-- Inventory file maintenance
-- User file maintenance
-- Film reservation
-- Shipping/check-in/check-out
-- Follow-up of past due films
-- Shipment management
-- Report generation
-- Catalog preparation

The described system sells for an average price of $40K-$65K depending on sophistication of the educational film library being served. Simple and easy procedures are characteristic in the system. Reliable and effective results can be expected in daily utilization. Complete management reporting is well served in the options available for the system.

Editors Note: Shell System cost $110,000 with an additional $50,000 in software development. System operates with 64K core.

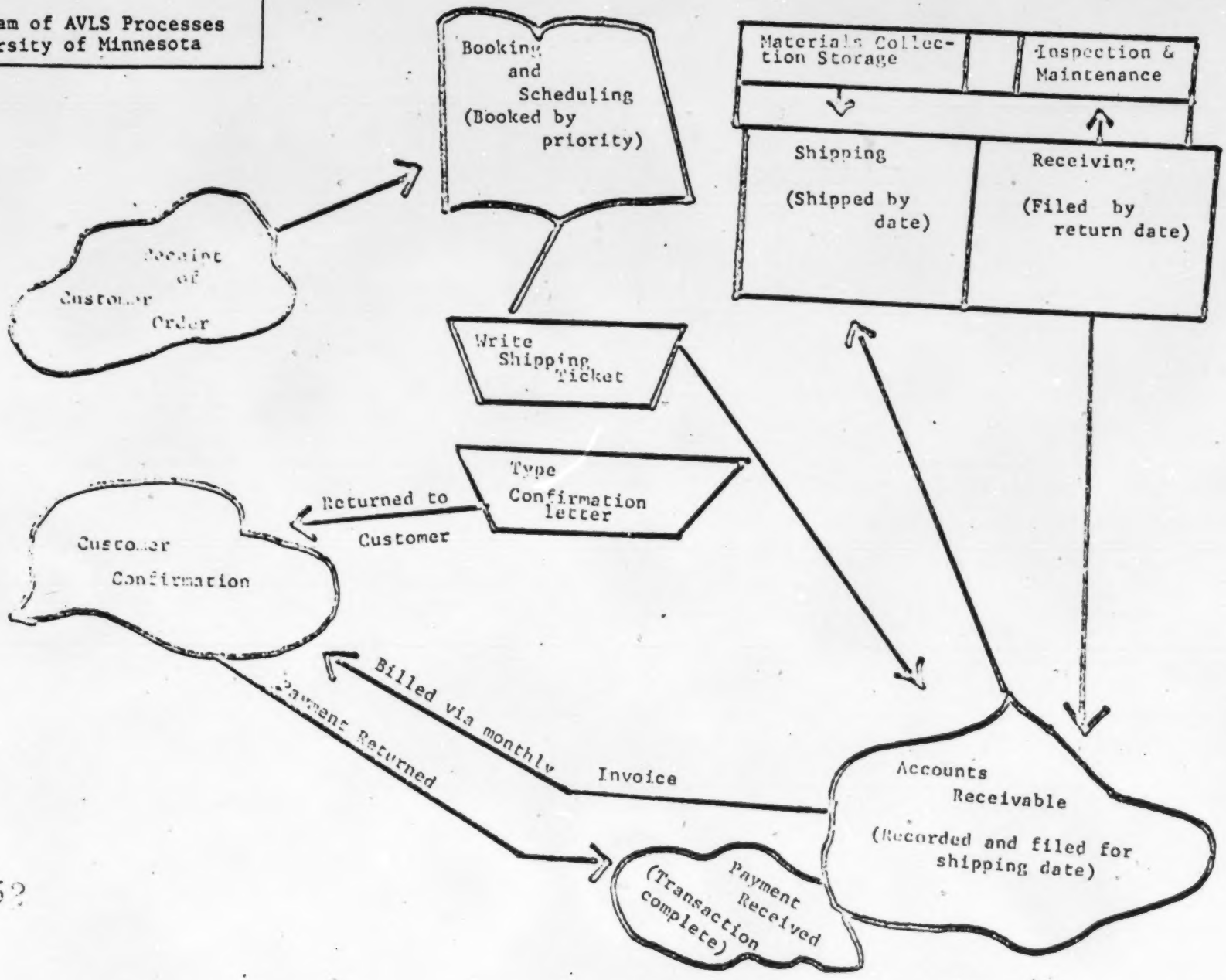
THE AUDIO VISUAL LIBRARY SERVICE
UNIVERSITY OF MINNESOTA
CASE STUDY

Because of the increased demands upon the Department of Audio Visual Library Service it was deemed wise to consider applying an automated systems approach to processing information necessary for distribution of resources materials. Since the operation of this service was similar to that found in the industrial supplies business world, it was believed that application of the data processing concept would relieve operational pressure on the audio visual resource library service in its distribution system. (See Exhibit 1 - Flow Chart of the Audio Visual Library Service Distribution.)

The booking and scheduling division of the Department was suffering from a real volume and time pinch in terms of being able to furnish rapid confirmation of materials scheduled for customer use. With the old Remington Rand Kardex manual system delays in handling customers orders were, at times, 21 working days behind a reasonable schedule. Since it was necessary to schedule materials for particular set programs, confirmation and shipment time was determined to need close coordination. With an increase in the amount of materials shipped to users the problem was compounded. (See Table 1 - Summary of Shipping to Users Identified by Film Title Units.) An increase was being experienced which need to be solved through various additions or changes: (1) increase the size of the Kardex manual system capacity which required adding one or more mechanical units to the operation, (2) increase the

Exhibit 1

Diagram of AVLS Processes
University of Minnesota



number of working staff which maintained booking and scheduling process or (3) provide for an automated systems approach to handling and processing data. There was a point in the expansion of the Audio Visual Library Service where additional machinery and personnel caused inefficiencies which could not be effectively coped with in the AVLS facility. It was believed that expansion would cause inefficiencies and poor economy. Therefore, it appeared that it would be wise to move forward and adopt an automated or computer based data processing system.

Table 2 , Summary of the Units Booked by Day, Week and Month, summarized the film units distributed through the shipping and receiving facility of the department. Although units were being shipped in the current operating year they were booked in the months of February, March, April, May and June which preceeded the new school term beginning in the fall. A 12% increase per year compounded the problem.

Table 3 , A Record of Film Booking Units Itemized by Monthly Average as Distributed in each Year-1948 through June of 1966. The table shows significant growth in curculation for the period. It also indicates a demand for educational media library support in terms of public demand for various film titles. It shows a significant demand upon the booking, scheduling, shipping, and receiving branches of the Service as well as the accounts receivable staff. (As a fee for service library the AR division is a necessary expense.). Because of increased demands which made it literally

Table No. 1

Summary of Shipping to Users

Identified by Film Title Units

Number of Film Shipments	39,389
Average Number of Shipments per Month	3,282
Average Number of Shipments per Week	820
Average Number of Shipments per Day	164

Table No. 2

Summary of Units Booked

by Day, Week and Month

Number of Booking Units	77,463
Average Number of Bookings per Month	6,455
Average Number of Bookings per Week	1,613
Average Number of Bookings per Day	322

Table No. 3

Record of Film Booking Units Itemized by a Monthly Average and the Total as Distributed in Given Years

Year	Average Booking Per Month	Total Booking Per Year
1948-49	1,888	22,666
1949-50	2,116	25,396
1950-51	2,239	26,879
1951-52	2,397	28,769
1952-53	2,499	29,989
1953-54	3,083	37,005
1954-55	3,292	39,508
1955-56	3,791	45,495
1956-57	4,040	48,488
1957-58	4,118	49,437
1958-59	4,273	53,776
1959-60	4,490	55,538
1960-61	4,590	59,896
1961-62	5,268	62,152
1962-63	5,408	64,894
1963-64	5,704	68,450
1964-65	5,957	71,485
1965-66	6,455	77,463

impossible for staff and the old manual system to accommodate economically and efficiently the information that must be processed through the operation, it was believed a revision in the type of processing system used was desirable. Exhibit 2 is a computer company estimate for the cost in providing for an installation involving a computer based system. Each system carried inherent design attributes. Careful study must be made of what particular computer systems can contribute to educational film operations over the long run. An operational study may indicate that the least expensive system is not necessarily the least expensive system in terms of its capability for a specific operation in a competitive service area. The computer system requested had the option of expanding mechanisms to accomplish a more sophisticated operational problem when needed. Much of the literature prepared by individuals interested in computer systems stated that labor savings made possible by addition of a computer system may pay for a large portion of the lease fee, if not all of it. It was concluded that in a five year period it would be necessary for AVLS to add at least three senior clerk typists to handle the manual booking and scheduling system with continued growth in circulation. (Table 3) With an automated booking system new staff positions didn't have to be added. However, it was necessary to add a computer analyst/programmer staff position to handle software generating the distribution information necessary to sustain the Audio Visual Library Service operation.

Exhibit 2

IBM 1130 SYSTEM

COMPUTER				PERIPHERAL EQUIPMENT			
Unit	Model	Description	Monthly Lease	Unit	Model	Description	Monthly Lease
1131	2B	Central Processing Unit, 8K words Disk Storage Drive, 512,000 words, Console Printer, 15 CPS	$1,010	029	C2	Interpreting Card Punch	$ 104
				082	01	Card Sorter	55
	4454	1442 Attachment	36				
				2315	01	Disk Cartridges (Purchase Only)	
1442	06	Card Reader Punch 300 Cards/Minute Read 80 Col/Second Punch	265				
1132	01	Printer 80 LPM Alphameric 110 LPM Numeric	268				
	3854	Expansion Adapter	5				
	3616	1132 Attachment	10				
		Total	$1,594			Total	$ 159
		Less Educational Allowance	159			Less Educational Allowance	15
		Net Total	$1,435			Net Total	$ 144

NOTE:

1. Any or all equipment on lease may be cancelled anytime after 90 days.
2. Peripheral equipment will be needed within various departments of the General Extension Division when departments become operational computerwise.

When viewing the problems experienced with the evolution of the library operation in the Audio Visual Library Service, certain criteria served as guidelines in selecting alternatives to proposed solutions. Among the alternatives which favored development of a computer system were:

a. Nonprofit Organization. As a nonprofit organization reduced operating costs and/or significantly improved ability to service customers provides the envoronment necessary to fulfill the charge of the Audio Visual Library to its patrons. If costs and ability can be made more efficient then a greater demand can be served. Certainly experience in the last three years clearly indicates an improved ability to serve with no significant changes in staff. Circulation statistics bear out this conclusion.

b. Increased Income/Expense Ratio. If the ability of the department's facilities can actually result in significant improvement in income while expenses can be held relatively stable, then the enterprise will become more attractive to the parent agency drawing from its financial resources. From experience the above phenomenon has been true even under difficult conditions created by inflation and sizable salary shifts.

c. Replacement of Otherwise Human Factors. As the Audio Visual Library Service continued to grow, it became apparent that some expansion of the machinery necessary to handle its administration and operation was mandatory. Increased labor in the facility added pressure on money, space and process. Other

alternatives minimizing the cited problems were desirable.

From review of the best research literature available, study of our management processes and analysis of the operation certain factors and elements made computer applications very attractive. Elements associated with computers were assessed to be:

a. Less real inventory was needed to meet larger demands.[1]
b. Application of computers would reduce stockouts.
c. Computers would improve scheduling efficiency and effectiveness.[2]
d. Computers would reduce the time necessary to complete the library's evolutions (i.e. faster collection of fees).
e. Computers when compared with human beings would minimize additional space requirements for total effects on the department's ability to provide a public service.

Management of the Audio Visual Library Service would reap benefits from computer applications in many ways. Among them are:

a. More timely submission of reports.
b. Improved analysis for decision making.
c. Improved ability to respond to demand and serve unique analysis.

Of course, certain conditions which are common to educational film library facilities and their management made automation even more attractive than it would in dissimilar organizations. The large volume of records and the space needed to store them was a pressing problem. Manipulation of data in files associated with the business evolution in educational film makes the problem very

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1. Inventory/Income Fiscal 66: 12,998/$269,700; Fiscal 67: 13,336/$287,400; Fiscal 68: 13,498/$315,300; Fiscal 69: 13,504/$327,800; Fiscal 70: 13,597/$408,600.
2. Uses per active print: Fiscal 66 - 7; 68 - 6.6; 70 - 8.9

complex. As expansion in demand for materials geometrically grows the time/work ration exceeded the staff's ability to serve and budget's ability to provide more labor. The only solution was in use of computer technology.

Although a move to DPC (Data Processing Central) appears to be the most convenient alternative in many cases, the staff of AVLS did find it a cost effective alternative, (verified through joint review by DPC management and AVLS). A long range goal for DPC and AVLS cooperative services that will not be realized until DPC acquires the necessary funding for additional staff and hardware to accommodate AVLS needs as well as the needs of others at the University of Minnesota. The time element is vague and uncertain since it still is questionable where AVLS ranks on DPC's list of priorities. Day school registration, payroll, and all other University requirements will continue to overshadow AVLS requirements in the opinion of the AVLS director. As a self supporting risk programming service AVLS needs sound management information on a timely and rapid basis to be effective and economically managed.

Therefore, as advised by the Cresap, McCormack and Paget study (unpublished),

> "If DPC were unable to provide equipment service because of the unique requirements of AVLS systems, because of other system priorities, or for some unforeseeable reason, AVLS might operate its own computer system".
>
> - A PLAN FOR DATA PROCESSING APPLICATIONS AND SERVICES DECEMBER 1970, pp. III-3

DATA PROCESSING HARDWARE

The inhouse computer installation appeared to be the best alternative in 1967 (IBM 1130 Mod3). Although output equipment was limited and the cycle time was among the slowest of available computers, the staff employed in AVLS and the lease costs of equipment made the system bery attractive. It was advised by the Cresag, McCormick and Paget study that:

> "The IBM 1130 should remain installed at the Audio Visual Department until such time as the applications it processes can be processed (to the satisfaction of the appropriate GED users) by DPC".
>
> - A PLAN FOR DATA PROCESSING APPLICATIONS AND SERVICES DECEMBER 1970, pp. III-6

However, since DPC will not be able to accommodate AVLS needs for quite some time, the study further advises that the 1130 be displaced by a new system that would be designed primarily for administrative application whereas the IBM 1130 was designed primarily as a small scientific computer.

There are basically three types of data processing systems that can be considered: card system, tape system and disc system or

combinations. In order to best satisfy the needs of AVLS, the best alternative was determined to be a combination disc/tape system. A disc system was needed to handle scheduling of library products and a tape system was needed to economically handle large volumes of mailing lists. (See appendix 1, Characteristics of Chosen AVLS Computer Systems and appendix 2, Summary of Installed System Costs for AVLS, University of Minnesota - 1973)

In order to efficiently and cost-effectively handle mailing lists, magnetic tape was determined to be the answer. A computer can prepare mailing lists from magnetic tape files with the cost of a completed label at less than one cent per address.

APPENDIX 2

SUMMARY OF INSTALLED COMPUTER CHARACTERISTICS

AUDIO VISUAL LIBRARY SERVICE

UNIVERSITY OF MINNESOTA

	1967 - 1973	1973 - Present
Manufacturer	IBM	General Automation
Model No.	11/30	18/30
Financial Arrangement	Leased	Purchased
Central Processor	1131 Model 2C	1840B
Core Memory	16K Words	16K Words
Word Size	16-bit words	16-bit words
Console Printer	Selectric	Teletype
Disk Drive	2310 Model B2	1343 - 1010
No. Drives	Three (3)	One (1)
Disk Storage	512,000 words	10 million words
Total on-line store	1,536,000 words	10 million words
Line Printer	1132	1353 - 1000
Rated Speed	120/lpm	600/lpm
Print Positions	120 positions	132 positions
Card Reader	1442 Read/punch Mod. 6	1317 - 1000
Card size	80 col.	80 col.
Rated speed	300 cpm	600 cpm
Card punch	1442 Read/punch Mod. 6	1314 - 1000
Card size	80 col.	80 col.
Rated Speed	80 col./sec.	35 cpm
Print cards	no	yes

APPENDIX I:

DATA STORAGE CHARACTERISTICS SUMMARY

CARD SYSTEM:	TAPE SYSTEM:	DISC SYSTEM:
In order to process the data in the desired sequence it would be necessary to sort card decks into the same order and collate them.	Magnetic tape provides a cheap form of storage. An unlimited number of records on magnetic tape can be stacked away on shelves. This is not random access storage because, to find a record at random from a reel loaded onto a tape unit, the machine must search the reel serially -- Indirect access storage device. Data stored in sequential order.	Direct access storage device allows for complete flexibility in the order of processing - direct access to any record regardless of which record was processed last or which record is next. Sequential or direct access.
Because of the physical limitations in a punched card (80 columns) it can be cumbersome as well as impractical to process long records that are kept in card form.	Ability to handle records greater than 80 characters.	Disc records may be as long as the sector size, however, the total amount that can be stored is limited to the capacity of these surfaces.
Card system would be less sophisticated and would require more machine time, operator time and handling time.	A larger number of input/output files can be processed at one time than in a card system.	Data is stored in the form of magnetized spots recorded at extremely high densities and read/written by a precise mechanism.
Cards can be mutilated, lost, ripped or misfiled.	More complete management information, multiple file consolidation and the combination and integration of various applications are among the significant advantages of a tape system (as well as of a disc system).	Although the disc cartridge is in a sturdy container, it is not immune to careless handling, loss, natural disaster, etc.
Card systems are generally limited to two or three input files and one output file.		A larger number of I/O files can be processed at one time than a card system.

	1967 - 1973	1973 - Present
Magnetic tape	no	1331 - 1011
Track size		9 track
Storage density		800 bpi
Rated speed		I/O 20 KB/sec
Operating System & Languages	DMS V2 Mod. 11	DMS V2 Mod. 11
Assembler	yes	yes
Fortran	yes	yes
Utilities	yes	yes
Communication Capabilities	yes	yes
TOTAL COST	$121,340.00	$91,890.00
ANNUAL MAINTENANCE	$3,768.00	$9,460

Costs based on 1973 quotations on used IBM equipment.

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